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Relative Reference Prices and M&A Misvaluations

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Abstract

Purpose – This paper examines the misvaluation hypothesis using a relative reference point (RRP) in M&A market.
Design/methodology/approach – This paper studies 1,878 deals announced between January 1, 1985 and December 31, 2014.
Findings – The paper finds that bidders prefer stock payments when the RRP increases. The RRP is positively related to the offer premium and the target announcement returns. Although the RRP is negatively related to the bidder announcement returns, it is positively related to the long-run performance of bidders who time the market with overvalued stocks. The results are consistent with the predictions of the misvaluation hypothesis and reference point theory.
Originality/value – We construct a dynamic valuation framework to explain the misvaluation hypothesis by linking M&As' misvaluation with reference point theory. Our paper provides direct evidence that the reference-dependence bias is prevalent for more experienced investors in major corporate investment decisions and offers fresh insights into the method of payment hypothesis.

Keywords Target reference point, bidder reference point, the misvaluation hypothesis, mergers and acquisitions

1. Introduction

The misvaluation hypothesis explains an important motive of mergers and acquisitions (M&As). The theoretical model of Shleifer and Vishny (2003) predicts that market misvaluation drives M&As. Overvalued bidders who serve the long-run interests of the shareholders will dilute overvaluation through stock-financed acquisitions. The misvaluation hypothesis holds that bidders are rational whereas the market is irrational. Following Shleifer and Vishny (2003), Dong *et al*. (2006) provided direct evidence that bidders overpay for targets when they are overvalued. Ang and Cheng (2006), who investigated the long-run performance of stock bidders, found a positive relationship between overvalued stocks and long-run performance. Rhodes-Kropf and Viswanathan (2004) provided a behavioural model to explain the reason why targets accept overvalued stocks, affirming that fully rational individuals can make mistakes of overestimating synergies, especially when market valuation errors are considerable (Rhodes-Kropf *et al*., 2005).

However, conventional misvaluation measures face three major challenges. Firstly, the measures relating to firms' fundamental value, such as price-to-book value (P/B) and price-to-residual income value (P/V), cause estimation biases. This is because different accounting approaches across the firms would make their fundamental value incomparable. Firms also tend to manipulate accounting figures to raise their value especially prior to financial crisis periods. Secondly, existent misvaluation measures are mainly based on historical or forward-looking information, according to Dong *et al*. (2006), which are less likely to reflect a firm's latest status. Thirdly, the frequently used MTBV is a problematic proxy, as it represents both mispricing and investment opportunities of the firm. According to Di Giuli (2013)[1], firms with better investment opportunities should also increase the propensity of using stocks in acquisitions, leading to the same prediction as the misvaluation hypothesis.

This paper constructs a new misvaluation proxy, called a relative reference point (RRP).[2] This proxy reflects M&A misvaluation from the perspective of the market's perception of the firm's valuation, hence eliminating any concerns regarding biases raised from the firm's fundamental value. Following Baker *et al*. (2012) who measure the target reference point with the deviation of a target's current stock price from its 52-week high price, we define the bidder reference point as the

[1] Di Giuli (2013) proposed some post-merger investment related proxies to disentangle the effects of mispricing and investment opportunities.

[2] Kahneman and Tversky (1979) develop prospect theory that people gauge gains and losses based on a reference point, which is rooted in the work of Tversky and Kahneman (1974). Prior research has highlighted the 52-week high as a reference price (Huddart *et al*., 2009, Kliger and Kudryavtsev, 2008, Grinblatt and Keloharju, 2001).

deviation of a bidder's current stock price from its 52-week high price. The RRP is the difference between the target and the bidder reference points, indicating the extent to which the bidder is relatively more overvalued than the target (i.e. relatively more overvalued bidders).[3] The reference point effect is salient in M&As as given a short period of time and limited information around the M&A announcement date, investors urge to refer to an easier accessible and the most relevant information in assessing the firm's valuation. Therefore, the RRP serves as a clear valuation indicator for the M&A deal.

Using M&As to investigate the RRP effect is of great interest mainly for two reasons. First, the RRP is a direct misvaluation measure that captures the market's perception of the firm's valuation, since market valuation avoids the controversy of using a firm's fundamental characteristics (Lin *et al*., 2011). Serving as a major corporate investment activity, M&As draw a great deal of investors' attention. With limited information and time in which to process that information prior to the M&A, investors are likely to make decisions based on the most current valuation information, making the RRP a suitable valuation proxy. Second, the RRP facilitates M&A process, as bidders can identify the sign of relative overvaluation through the RRP. An increase in the RRP would potentially drive a relatively more overvalued bidder to dilute overvaluation through acquisitions. Therefore, the RRP allows us to observe how major investments are structured.

Analyzing a sample of 1,878 U.S. domestic public acquisitions announced between 1985 and 2014 and using the RRP to test the predictions of the misvaluation hypothesis, we find that the propensity to use stocks as a means of payment for acquisitions increases with the RRP, which is more pronounced when market-wide valuation is high. Moreover, bidders tend to pay higher offer premiums in larger RRP acquisitions. Our results continue to hold after controlling for endogeneity that may arise from omitted variable biases. Finally, though the RRP leads to negative bidder announcement returns, indicating a role of overpayment, offer premiums according to the RRP are translated into less negative abnormal returns for stock bidders in the long-run, suggesting that bidders manage to protect the wealth of shareholders with the RRP. Overall, our findings are consistent with the predictions of the misvaluation hypothesis and reference point theory.

This paper makes four distinct contributions to the literature. Firstly, this paper explains the misvaluation hypothesis from the perspective of the reference point effect. We develop a dynamic

[3] We present the construction of the RRP in the methodology section of this paper.

valuation framework based on market's perception of the firm's valuation. A higher price relative to the reference point price is more likely to occur in the higher valuation periods associated with larger valuation errors, which increases the probability of the firm being overvalued. The RRP allows us to examine how the difference in market valuation between the two firms involved drives M&As. We lift the bar to the market level, eliminating any estimation biases arising from the use of the firm's fundamental value.

Secondly, to the best of our knowledge, this is the first paper to link M&A misvaluation with reference point theory. The RRP is likely to shape investors' minds, for it is easily observable, and thus serves as the valuation benchmark for the M&A participants. Baker *et al*. (2012) found offer premiums increase with the target 52-week high, implying that the target reference point alters bidders' perception of the target's valuation. Targets negotiate for larger offer premiums when their current price deviates greatly from their 52-week high price. Similarly, Chira and Madura (2015), who focused on the reference point effect on acquisition probability, argued that bidders are unwilling to bid for a firm whose price is heavily discounted from its 52-week high price. This suggests that targets would frustrate bidders with large offer premiums when targets are perceived to be according to the reference point.

Thirdly, the paper provides direct evidence that, in the face of the reference-dependence bias, the more experienced investors tend to behave similarly to the less experienced investors in major corporate investment decisions. However, it is interpreted differently; the market looks at the offer premium paid according to the RRP as a result of overpayment, while bidders time the market through the RRP. There are less negative long-run abnormal returns for the relatively more overvalued stock bidders compared with the relatively less overvalued (or more undervalued) stock bidders.

Fourthly, the paper offers fresh insights into the method of payment hypothesis. We suggest that the sign of relative overvaluation is well indicated by the RRP, relaxing the assumptions of irrational targets (Shleifer and Vishny, 2003) and valuation-error-misled targets (Rhodes-Kropf and Viswanathan, 2004) regarding the target's motive of accepting overvalued stocks,[4] since both bidders and targets can identify any relative overvaluation. Bidders reduce offer premiums by

[4] Common assumptions on whether the target will accept the overvalued stocks suggest that targets either have a cash-out purpose (Shleifer and Vishny, 2003) or misled by the market perception (Rhodes-Kropf and Viswanathan, 2004).

paying stocks than cash for a larger RRP acquisition and paying cash for a lower RRP acquisition compared with the case of a higher RRP acquisition.

The remainder of the paper is organized as follows: Section 2 designs hypotheses. Sections 3 summarize the data and present the methodologies. Section 4 analyses the empirical results while Section 5 conducts further robustness checks regarding the role of the RRP played in the M&A surveyed. Section 6 concludes the paper.

2. Hypothesis development

The RRP takes the work of Baker *et al*. (2012) in two directions. Baker *et al*. (2012) report negative bidder announcement returns when offer premiums are paid according to the target 52-week high, indicating that reference point effect leads to overpayment. On the other hand, they argue that bidders who pay according to the target reference point would believe that they could outperform the target recent high. Lacking further investigation on the reference point effect on the long-run M&A motive, their study fails to address why bidders pay large offer premiums based on the target reference point, given that the sign of overpayment is clear. Our paper assesses the long-run performance of stock bidders with the RRP, based on the rationale that relatively more overvalued bidders tend to use stocks for financing M&As for long-run consideration (Shleifer and Vishny, 2003). If negative market reactions to a bid announcement are the result of managerial reference-dependence bias, bidders would perform consistently poorly in the long run, as the market will downgrade the firm's value when it recognizes that M&As are structured by managerial perception according to Ma *et al*. (2016).

Furthermore, we add the bidder reference point to interpret M&A valuation. It is evident that investigating the target reference point alone does not fully account for the bidder's M&A motive. The market would also look at the bidder reference point, for it is relevant price information readily available for the public. Chira and Madura (2015) argue that bidders also assess their value according to the bidder reference point. They are unwilling to pay with stocks when the current price deviates greatly from the 52-week high price, which is a sign for undervaluation. In addition, a small distance between the target current price and the reference point price could offer bidders the opportunity for overvaluation dilution only if bidders have even a higher price relative to the bidder reference point. On the other hand, a bidder with a high price relative to its reference point price

offers the market an intuition that the firm performs well currently, which reinforces its bargaining power in an M&A deal. As a result, the firm might tend to pay a lower offer premium otherwise, the deal might be perceived as an overpayment. Therefore, the bidder reference points reveal the bidder's M&A motive.

If the RRP is a suitable proxy for misvaluation, bidders make decisions according to the RRP with the intention to time the market. It is also apparent that all market players can recognise this sign of overvaluation through the RRP. Though bidders time the market by paying overvalued stocks, they are vulnerable, as rational targets (Rhodes-Kropf and Viswanathan, 2004) could accept more overvalued stocks as a form of compensation (Vermaelen and Xu, 2014). Hence, using only the reference point of the one party is less likely to explain the relative overvaluation. For example, the fact that bidder's current price reached its 52-week high price may still not reflect the case that the firm could still be undervalued, especially if the firm has great profit-generating potential that could lead to a higher 52-week price in the future. As a result, bidders would avoid paying too much in M&As. Moreover, they are more willing to pay with cash instead of stocks if their stocks are depressed. Chira and Madura (2015) suggest that optimistic managers who are more likely to acquire their firms (i.e. management buyout) than outsider firms would do so, if the stock price is low relative to the 52-week high price. The RRP eliminates any of these concerns regarding the true valuation of the firm, as the proxy focuses on the relative valuations raised at the market level. We expect that managers should focus on the relative misvaluation, which is in line with the view of Dong *et al*. (2006) that misvaluation encourages M&As. The market drives the market valuations of the two firms involved away from their fundamental values, providing bidders with greater mispricing opportunities when they are relatively more overvalued.

The RRP is able to accommodate the market's intuition of M&A misvaluation. Unlike Dong *et al*. (2006) and Rhodes-Kropf and Viswanathan (2004),[5] we unify the investors' view to the firm's valuation with the reference point. George and Hwang (2004) found reference-dependent bias driving firms' misvaluation from the stock market. Investors should be reluctant to bid up a stock price when it is close to the 52-week high price, as prior good news has driven the firm value beyond its fundamental value, leading the market to believe that the firm is overvalued. In contrast,

[5] Dong *et al*. (2006) proposed the price-to-book value and the price-to-residual income value for bidder misvaluation whereas Rhodes-Kropf and Viswanathan (2004) proposed a misvaluation measure based on an assumption that targets are rational.

investors should be reluctant to sell stocks when their prices deviate greatly from the 52-week high price, implying that the firm might be possibly undervalued. We extend these arguments in the context of M&As where managers are theoretically highly committed to creating value for the firm instead of exploring short-run profits from possible mispricing phenomena. We examine the case of possible misvaluation from the perspective of the market based on the change of the market's perception of the firm's valuation in contrast with Dong *et al*. (2006), who investigated the firm's overvaluation from the perspective of the managers and measure relative valuations with the difference between the firm's market price and its fundamental value.

We suggest that the bidder reference point is as important as the target reference point in explaining the M&A motive. Baker *et al*. (2012) proposed the target reference point to explain how much bidders should pay for the target. We suggest that the bidder reference point would lead bidders to consider how much they could pay for the target. Poorly performing firms may find it difficult to provide any rationale to pay large offer premiums, whilst those with a stock price that is close to its 52-week high price are regarded as rich in financing resources and thus will dominate the negotiation table. It is also much easier for a well-performed bidder to convince their shareholders that the firm is able to manage the deal. Hence, it is likely that bidders will employ their reference points to rationalize the M&A motive. On the other hand, a bidder's price that is close to the 52-week high price may risk the firm's prospects. Barberis and Xiong (2009) suggest that investors tend to sell stocks whose price is close to the peak price. Huddart *et al*. (2009) also reported large abnormal sales' volumes around the 52-week high price. Therefore, though bidders have full access to the firm's fundamental characteristics, they need to justify their decisions through the reference points.

The RRP also explains the reason why targets tend to accept more overvalued stocks voluntarily. The misvaluation hypothesis suggests that bidders are likely to pay with stocks for acquisitions when they are overvalued (Dong *et al*., 2006, Ang and Cheng, 2006). We expect the RRP, which reflects market's perceptions of the firm's valuation, to provide a more straightforward implication. The RRP signals to the target what price they can possibly negotiate with the bidder. If targets believe, using the target reference point, that they are overvalued, they would find it even harder to justify this market's perception to overvaluation, as they are generally smaller and lack better investment opportunities than the bidders. As a result, targets tend to accept more overvalued stocks

for liquidity purposes. If this is true, targets tend to sell their firm for a possibly high price through the bidder reference point. In addition, an increase in the RRP also leads target shareholders to believe that bidders are attractive, as it is more likely for the bidder to rebound to a higher reference point price than the target (Chira and Madura, 2015). Hence, they might believe that selling the firm to a well-run bidder would be more likely to generate wealth.[6]

The misvaluation hypothesis of Shleifer and Vishny (2003) indicates that bidders use stocks when they are overvalued. Such a sign of overvaluation is revealed by the firm's reference point, as the market has a tendency to assess the firm's valuation by its reference point (Baker *et al*., 2012). Managers will also consider eliminating these overvaluation concerns through the reference point. The RRP reflects the extent to which the bidder is relatively more overvalued, which facilitates the method of payment. Bidders tend to pay with stocks for targets when the RRP reveals that bidders more overvalued in relative terms, since holding overvalued stocks in the market will hurt the value of the firm in the future. Therefore, the probability of using stocks for payment purposes increases in line with movements in the RRP, leading to our first testable hypothesis of:

H1: There is a positive correlation between the RRP and the likelihood of using stocks as a means of payment in M&As.

Dong *et al*. (2006) suggest that bidders will use both stocks and cash to dilute overvaluation, as it remains a priority objective for bidder managers. Shleifer and Vishny (2003) suggest that bidders' overvaluation is diluted through acquiring a less overvalued firm. We measure relative bidder-target valuations with the RRP. Consistent with the misvaluation hypothesis, we expect that bidders would increase offer premiums when they are relatively more overvalued (than the target firms) as reflected in the RRP. In addition, offer premiums are likely to be raised when targets can identify any sign of misvaluation with the RRP. Based on the above argument we hypothesize that:

H2: M&A offer premiums are positively correlated with the RRP.

Bidders with a high price relative to 52-week high should have stronger bargaining position,

[6] In the light of this, Burch *et al*. (2012) found targets tend to reserve bidders' overvalued stocks, believing that highly-valued bidders are also well-performed or have better investment opportunities.

leading shareholders to expect a low offer premium paid to the target, whereas a high offer premium leads the market to believe that there is an overpayment, incurring negative market reactions to the bid announcement. On the other hand, we argue that the target firm as shareholders would expect that targets with a relatively higher reference point would have a higher probability of profiting through acquisitions. Therefore, our third testable hypothesis is:

H3: Bidder (Target) short-run performance is negatively (positively) correlated with the RRP.

Finally, an increase in the RRP suggests that bidders are relatively more overvalued, leading bidders to use stocks to alleviate the risk of overvaluation, whereas cash payment may introduce further overvaluation if targets are already overvalued. If this is the case, M&As serve as a value-enhancing opportunity for those exploring relative valuation with overvalued stocks. Therefore, we limit our sample to stock bidders, leading to our last testable hypothesis of:

H4: There is a positive correlation between stock bidder's long-run performance and the RRP indicator.

3. Data and methodology

3.1 Data

The initial sample covers 36,506 U.S. domestic public acquisitions announced between January 1, 1985, and December 31, 2014, as provided by Thomson One. Stock price is collected from CRSP, and a series of standard accounting variables are collected from COMPUSTAT. We require those accounting variables to be available for the fiscal year end prior to the announcement date. Public acquisitions refer to the two firms involved being publicly traded U.S. firms (listed on NYSE/AMEX/NASDAQ).[7] Once we excluded deals that were classified as recapitalizations, repurchases, self-tender offers and rumors according to Thomson One, we are left with 11,615 observations. We require that the offer premium is not a missing value, which further reduces the number of observations to 5,450. We require the stock price for the calculation of the bidder and the target 3-day CARs to be available, which reduces our sample to 4,630 observations. We also require the payment method information to be available in Thomson One, leaving us with 4,290 observations. The final sample of our study comprises of 1,878 observations after excluding all

[7] We required firms with available stock price to calculate the firm's reference point price.

bidders and targets with missing values on the selected variables (2,134 and 278 firms respectively).[8]

We first studied the RRP effect on the probability of using stocks as a means of payment for acquisitions. Bidders' size is expected to be negatively related to the stock-financed acquisition. Faccio and Masulis (2005) suggest that larger bidders have higher credit facilities, which reduces the probability of using stocks to pay for acquisitions. We measure the firm's growth opportunities with MTBV. Higher MTBV bidders tend to use more stocks in acquisitions, in that they reserve cash to fund new investment projects (Rhodes-Kropf *et al*., 2005, Dong *et al*., 2006). We measure firm profitability with the return-on-asset ratio (ROA). We suggest that firms with higher profitability are more likely to use retained earnings held in cash rather than stocks as it reduces costs of financing. We also account for the target characteristics, since stocks are more likely to be used to mitigate the target risk (Hansen, 1987). In this respect, the propensity to use stocks is greater when targets' risk increases, such as targets are large, with high MTBV and low ROA.

Following Officer (2004), we measure information asymmetry with the standard deviation of the firm's stock returns. Hansen (1987) suggests that stocks are more likely to be used when level of information uncertainty increases. Leverage is defined as debt-to-equity ratio (D/E). Vermaelen and Xu (2014) suggest that over-levered bidders who justify stock financing in terms of moving to an optimal capital structure lead to an increase of overvalued stocks accepted by targets, whereas highly leveraged targets should be reluctant to receive overvalued stocks. We proxy liquidity using the cash flow-to-equity ratio (CF/E). Higher liquidity firms are more likely to be less financially constrained firms, which result in the method of payment for acquisitions is cash rather than stocks. Inclusions of capital structure related variables in the regressions should allow us to disentangle the effects of firm's capital structure decision and misvaluation on stock-financed acquisitions.

In a further analysis, we study the RRP effect on the offer premium. Different categories of variables were controlled in line with the work of Eckbo (2009). Specifically, we measure firm size with a logarithm of market valuation (MV). According to the hubris management hypothesis (Roll, 1986), larger bidders tend to pay generously for smaller targets. We measure the firm's profitability with ROA. Agency theory suggests that poor-performing bidders tend to dissipate firms' resources, and thus overpay for the target, whereas well-performing firms are attractive to bidders (Schwert,

[8] We excluded all the missing variables that are not used in the regressions and reported the summary of the acquisition sample and variables.

2000). We measure firm growth opportunities with MTBV. Rau and Vermaelen (1998) suggest the extrapolation hypothesis that glamour bidders are less cautionary than value bidders about the target valuation, leading to higher offer premiums. Harford (1999) suggests that the target MTBV links with the managerial takeover motive since bidders are more aggressive in exploring synergies from the lower MTBV target. Stock volatility is proxied using the standard deviation of returns over 335 calendar days ending 30 calendar days prior to the announcement date. Following Schwert (1996), we also take the firm's run-up price into consideration when examining offer premiums. All regressions include year and industry effects to overcome the outlier effect.

3.2 Summary statistics

Table 1 reports a summary of the acquisition sample. The mean (median) value of the deal in our sample is $1,540.29 million ($227.49 million).[9] Of 1,878 acquisitions, 608 all stock-financed acquisitions, 726 all cash-financed acquisitions and 539 mixed acquisitions.[10] We have 702 diversifying acquisitions, 1,597 successful acquisitions[11] and a small proportion of tender offers and hostile acquisitions, 380 and 134 respectively.

[Insert Table 1 here]

Table 2 reports summary statistics for variables. Panel A presents the dependent variables used in OLS regressions, including offer premiums, the bidder and the target 3-day CARs (CAR3) calculated using the market model. The mean offer premiums is 31%. Panel B presents the main variables of interests. The mean bidder reference point in our sample is lower than the target reference point, 29.4% to 41.2%, showing that bidders on average are relatively more overvalued in M&As according to the RRP. The mean value for the RRP is 11.8%. Panel C presents all control variables. Bidders are generally larger, have better performance and better investment opportunities than their targets, measured with the firm's MV, ROA and MTBV respectively. These findings are consistent with prior M&A literature (Fuller *et al*., 2002, Moeller *et al*., 2004).

[Insert Table 2 here]

3.3 Methodology

[9]Our sample includes only public acquisitions whose transaction value is large each year on average according to the summary of sample in Table 1, which alleviates our concerns that small deals may bias our results.
[10]The method of payment information for five acquisitions is defined as "Others" in Thomson One.
[11]Our research retains both successful and failed M&A deals, as reasons for deal failure are complex and not easily observable. The reference point effect mainly explains the bid initiation rather than whether the deal is finally acquired, as in the note of Baker *et al*. (2012). In that case, we include all M&A deals to make our findings widely applicable.

3.3.1 The relative reference point (RRP) and offer premiums

The 52-week high price is a highly relevant piece of price information that shapes investors' minds to the firm's prospects. The market would naturally borrow it as a reference point (RP). According to George and Hwang (2004), the 52-week high price is an outcome of a series of good news that occurred in the past driving the firm's market value beyond its fundamental value. This proxy is associated with market's perception of the firm's valuation. A high price relative to the 52-week high price would therefore indicate that the firm is still in the momentum of the "good news", leading the firm to be more overvalued. In contrast, a low price relative to the 52-week high price indicates that the good news effect is less relevant or the firm experiences bad news, leading the firms to be less overvalued or more undervalued. A firm with a high price relative to its 52-week high price will acquire a firm with a lower relative price. Therefore, a target reference point (TRP) that is larger to the bidder reference point (BRP) is a sign that the bidder is relatively more overvalued. The extent to which the bidder is more overvalued than the target is measured with the relative reference point (RRP). Our data also show that TRP is on average larger than BRP.[12] Formulas for RP, RRP and offer premiums are as follows:

$$RP_i = \log(52WeekHigh_{i,t-30}) - \log(StockPrice_{i,t-30}) \tag{1}$$

$$RRP_i = TRP_i - BRP_i \tag{2}$$

$$OfferPremiums_{i,t} = \log\left(OfferPrice_{i,t}\right) - \log\left(TStockPrice_{i,t-30}\right) \tag{3}$$

where RP_i denotes the reference point of each firm i. The bidder (target) reference point is defined as the logarithmic term difference between the bidder's (target's) highest stock price over 335 calendar days ending 30 days prior to the announcement date and bidder's (target's) stock price 30 calendar days prior to the announcement date.[13] *RRP* denotes the relative reference point defined as the target reference point (*TRP*) and the bidder reference point (*BRP*). Offer premiums are calculated as the logarithmic term difference between the offer price (*OfferPrice*) and target stock price 30 calendar days prior to the announcement date ($TStockPrice_{i,t-30}$).

[12] We used the difference between the target reference point and the bidder reference in an attempt to obtain a positive value, making our results easier to interpret.

[13] This mitigates the effect of information leakage on the stock price.

3.3.2 Classification of high-, neutral- and low-valuation markets

Rhodes-Kropf and Viswanathan (2004) suggest that stock-financed acquisitions are positively related to market-wide valuation. Following Bouwman *et al*. (2009), we classify market valuation periods using the price-earnings (P/E) ratio of the market index (S&P 500) and monthly data. First, we de-trend the market P/E ratio by removing the best straight-line fit (OLS) from the P/E of the month in question and the five preceding years. Secondly, each calendar month is classified into high- (low-) market valuation groups if the de-trended market P/E ratio of that month is above (below) the five-year average. Then, we rank the months according to the de-trended market P/E ratio. Months in the top 25% of the above average group are classified as high-market valuation months, months in the bottom 25% of the below average group are classified as low-market valuation months, the remaining months being classified as neutral-market valuation months. Thus, half of the months are classified as neutral-market valuation and the other half contains months of both high- and low-market valuation. The idea of de-trending market valuation is to remove the upwards trend because the most recent acquisitions generally have a higher market valuation than the past due to market inflation and other effects.

3.3.3 Short-run method

Following Eckbo *et al*. (2016), we calculate firms' announcement returns using the market model

$$R_{i,t} = \alpha + \beta_1 R_{m,t} + \varepsilon_{i,t} \tag{4}$$

where $R_{i,t}$ denotes holding period returns (CRSP: RET) for firm i in the period t, $R_{m,t}$ denotes value-weighted market returns including dividends (CRSP: VWRETD), $\varepsilon_{i,t}$ denotes the error term. We estimate the market model parameters over the window from 261 to 28 trading days prior to the announcement date [-261, -28], and used a 3-day event window [-1, 1].

3.3.4 Long-run method

Following Loughran and Vijh (1997), we calculate firm's long-run performance with market-adjusted buy-and-hold abnormal returns (BHARs). This captures investors' long-run holding experience. We calculate 36-month BHARs with the following equation:

$$BHAR_{i,t} = \prod_{t=1}^{T}(1 + R_{i,t}) - \prod_{t=1}^{T}(1 + R_{index,t}) \tag{5}$$

where $R_{i,t}$ is the arithmetic returns for firm *i* on day and $R_{index,t}$ is the arithmetic return for the market index on day *t*.

4. Empirical results

4.1 The RRP effect on the probability of using stocks

Table 3 reports a positive relationship between the RRP and the likelihood of using stocks. Specification (4) shows that stocks are 1.04% more likely to be used when the RRP increases 10% (*t* = 3.453). The inclusions of information asymmetry, and capital structure related variables of the two firms involved do not change the sign and significance level of the RRP. Bidders are more likely to use stocks when information asymmetry is high. It is also suggested that stocks are likely to be used when the firm's leverage is high, suggesting that bidders are cautious about using debt for investments when they have large financial risks.

[Insert Table 3 here]

Results are consistent with the those of Eckbo *et al*. (2016) finding small firms are likely to use stocks. Our main results suggest that the relatively more overvalued bidders are likely to use stocks on M&A transaction,[14] which are consistent with what Shleifer and Vishny's misvaluation hypothesis (2003) predicts regarding the target's motive of accepting overvalued stocks. Bidders whose price is close to their 52-week high price would give targets a chance of selling out overvalued shares for profits. Our results show that targets tend to accept stocks of bidders with high MTBV (*t* = 3.846), which is consistent with the view of Burch *et al*. (2012). Our results also suggest that bidders time the market with the RRP. When the market news has driven the target firm's current value away from its fundamental value, bidders have an incentive to exploit such mispricing with overvalued stocks, believing that it provides greater potential for overvaluation dilution.[15]

[Insert Table 4 here]

Table 4 reports the RRP effect on the probability of using stocks under different market conditions. Rhodes-Kropf and Viswanathan (2004) indicate that the overestimation of synergies

[14] Our results are robust when replacing the RRP with a ratio of the target reference point over the bidder reference point to, indicating the extent to which the target is less overvalued relative to the bidder.

[15] It can be argued that when the target current price is significantly lower than its 52-week high, the target may experience risks of bankruptcy. In that case, we believe that bidders would be cautious about these targets and may not focus on their 52-week high. Our study focuses on the whole sample.

increases with market valuation errors. Consistent with this view, we find that the RRP effect is more pronounced when valuation errors are large. *Table 4* shows that for every 10% increase in the RRP would lead to an increase of using stocks about 1.53% when the market-wide valuation is high and 1.09% when the market-wide valuation is neutral. The RRP effect on market condition is insignificant in the low market-wide valuation periods when mispricing opportunities are low.

4.2 The RRP effect on the offer premium

Thus far, we have examined the reference point effect on stock-financed acquisitions, suggesting that managers time the market with overvalued stocks revealed by the RRP. It remains interesting to explore the reference point effect on bidders' pricing decision. Baker *et al*. (2012) found that M&A pricing decisions are based on the target 52-week high price. We examine the M&A motive of the two firms involved by studying the RRP effect on offer premiums.

[Insert Table 5 here]

The first four specifications of *Table 5* used different categories of control variables.[16] The sign and significance level of the RRP do not change significantly compared with that reported in specification (5). It reports that the RRP is positive and significant at the 1% level (coefficient 0.109, t = 4.726), showing that a 10% increase in the RRP is associated with a 1.09% increase in offer premiums. The signs and significance levels of our control variables are consistent with prior M&A studies (Moeller *et al*., 2004, Alexandridis *et al*., 2013). Our results suggest that the relatively more overvalued bidders overpay for the target according to the RRP, which are consistent with the reference point theory of M&A. It can be interpreted as follows: bidders perceived as overvalued will pay a price according to the target reference point to obtain the deal and thus diluting overvaluation (Baker *et al*., 2012). Moreover, when bidders' price is close to the 52-week high price, they will suffer significant losses in the long run either because of initial overvaluation to be corrected (Jensen, 2005) or their stocks to be aggressively sold around the peak price (Barberis and Xiong, 2009). Hence, through timing the market with the RRP, bidders would pay heavily for a less overvalued target to revise the market's perception. On the other hand, targets would also demand high offer premiums, as a high price relative to the bidder reference point leads targets to believe that the bidder is able to pay higher offer premiums. Our study, by extending the sample period of

[16] We produce a correlation matrix for our independent variables. These results are presented in Appendix A showing little evidence of econometric problems, such as multicollinearity issues.

Dong *et al*. (2006), provides up-to-date evidence that M&A offer premiums increase with market valuation errors, as reported in Appendix B.[17] Our results obtained in this table suggest that high offer premiums area form of compensation for the targets' willingness of accepting overvalued stocks. Therefore, the RRP rationalises bidder's M&A offer premiums.

[Insert Table 6 here]

However, we are aware of the fact that not all acquisitions in our sample involve a relatively more overvalued bidder measured with the RRP. In addition, bidders may have difficulty in paying high offer premiums if they were undervalued. Thus, we partitioned our sample into two subsamples, the relatively more overvalued bidders (i.e. RRP>0) and the relatively more undervalued bidders (i.e. RRP<0). In line with Dong *et al*. (2006), overvaluation motivates the firm to engage in M&As, we therefore expect that firms of these two subsamples perform significantly different.

We conducted univariate analyses regarding to the offer premium, bidder and target announcement returns, as reported in *Table 6*. Our results show a majority of deals are RRP driven, 1,155 as opposed to 723, which is consistent with the findings of Fu *et al*. (2013) while contradicts the view of Savor and Lu (2009). Panel A of this table reports that acquisitions are carried with significantly larger offer premiums when bidders are relatively more overvalued than the opposite case, the mean difference for the offer premium is 5% and at the 1% significance level. Our results suggest that overvalued bidders are likely to pay with high offer premiums for the undervalued or less overvalued targets, suggesting that managerial primary M&A motive is to dilute overvaluation. Due to this, bidders believe targets may not accept the deal until high offer premiums are paid. Our findings corroborate those of Baker *et al*. (2012) by showing a positive relationship between the offer premium and the target reference point[18]. In Panel B, both subsamples show significantly negative bidder announcement returns. The relatively more overvalued bidders perform significantly worse than the relatively more undervalued bidders, with a negative mean difference of 0.8% and at the 5% significance level. These results are also consistent with those of Ma *et al*.

[17] Our sample period covers the high valuation trends when investors' misperception is high, such as the stock market bubble between 2000 and 2002, and the housing bubble and credit crisis between 2007 and 2009. Our results show that the misvaluation hypothesis is more likely to explain acquisitions after 1990 than before 1990 when the primary M&A motive is synergies. The misvaluation tends to be larger after than before 2008 financial crisis. Once again, our results show that the relative overvaluation drives M&A's overpayment.

[18] *Figure 1* illustrates the relationship between offer premiums and the target reference point in the relatively more overvalued bidder subsample (i.e. RRP>0), as offer premiums paid to these M&As are mainly driven by the relative more overvalued bidders. Our trend is similar to that in the work of Baker *et al*. (2012).

(2016) who found that bidders with a lower price relative to their 52-week high price outperform those with a higher price relative to the reference point price. Panel C reports target announcement returns by the RRP. Both relatively more overvalued bidders and more undervalued targets receive stronger market reactions than the other group. In particular, the mean difference for target announcement returns is 4.9% (t = 4.33), suggesting that targets involved in high RRP acquisitions can demand high offer premiums based on the RRP, which is translated into higher announcement returns.

Panel D reports univariate analysis results for the offer premium by the method of payment in the two RRP subgroups. Our results are consistent with the prediction of the misvaluation hypothesis that overvalued stocks are used as cheap currency. Specifically, all cash-financed acquisitions carry higher offer premiums when bidders are relatively more overvalued than relatively more undervalued bidders. As the result shows a mean difference of 8.5%, which is at 1% significance level. Moreover, the mean difference of cash and stock payments for acquisitions in the case that bidders are relatively more overvalued is 3.92%, suggesting that all stock-financed acquisitions carry lower offer premiums than all cash-financed acquisitions when bidders are relatively more overvalued. Combined, relatively more overvalued bidders tend to avoid using cash, as it will increase the offer premium. Our results note the reason of overvalued bidders using stocks for acquisitions in terms of takeover costs, indicating that the RRP indicates managerial method of payment choices.

4.3 Whether relatively more overvalued bidders benefit in the short run?

Since the RRP reflects the market's perception of the firm's valuation, we directly assessed the market's reactions to the relatively more overvalued bidders, as reported in *Table 7*. If all market players can recognise, through the RRP, the sign of relative overvaluation, negative market reactions to a bid announcement should increase with the RRP. Using the target 52-week high as an instrument variable of offer premiums in the regression of bidder announcement returns on offer premiums, Baker *et al*. (2012) found that the target reference point price leads to overpayment. The reason of doing this is because that the target reference point price is uncorrelated with bidder management. We duplicated the test of Baker *et al*. (2012) using our dataset with a similar expectation that increased offer premiums, based on the target reference point, would lead to higher

negative market reaction for bidders as those firms may find hard to justify this overpayment in the short run. Our findings, reported in Appendix C,[19] are similar to those of Baker *et al*. (2012) providing further evidence on the reliability of our study.

[Insert Table 7 here]

Our results show that bidders (targets) receive more negative (positive) market reactions by the RRP. Specifically, the mean difference for a bidder CARs in a higher RRP acquisition and a lower RRP acquisition is negative (1.38%) and significant at the 1% level, as reported in Panel A. Targets' announcement returns are positive and increase with the RRP, as reported in Panel B.[20] Our results are in line with the reference point theory of M&As. The market would presumably believe that the chance of price rebounding tends to increase when the bidder's current stock price is close to its 52-week high price. However, engaging in takeovers makes it hard to realise the wealth of shareholders in the short run. The market reacts negatively to the bid announcement, as it believes that bidders are unable to deliver real support to the firm's performance and that they are likely to undertake bad acquisitions to maintain such overvaluation (Jensen, 2005).

4.4 Do stock bidders protect the wealth of long-run shareholders?

We now turn to investigate whether bidders focusing on the RRP protect the interest of their long-run shareholders. According to the misvaluation hypothesis, bidders dilute overvaluation with stocks in an attempt to protect the wealth of long-run shareholders. We suggest that bidders making an offer price based on the RRP would follow a similar rationale. In *Table 8*, we limit our sample to acquisitions that are 100% financed by stocks only and rank the sample into four quartiles according to the RRP, each presenting 152 observations, as reported in Panel A.[21] We examine whether overpayment leads underperformance. By doing so, we estimate the relationship between the offer premium and long-run performance under market-adjusted model for each correspondent quartile. The fourth quartile (i.e. the highest RRP rank) includes acquisitions involving relatively more overvalued bidders whereas the first quartile (i.e. the lowest RRP rank) includes acquisitions

[19] We do not follow the approach of Baker *et al*. (2012) by using our main proxy RRP as an instrumental variable for offer premiums, since it contains both the bidder and target valuations that are correlated with bidder announcement returns. Doing so will introduce estimation bias in our results. Our results show that the target 52-week high-driven-offer premiums lead to more negative bidder announcement returns.

[20] Our results are also robust when CARs were estimated using a 5-day window and the market-adjusted model is employed.

[21] Of the 608 all stock-financed acquisitions, 402 fall into the group in which bidders are relatively more overvalued.

involving relatively less overvalued or more undervalued bidders.

[Insert Table 8 here]

Results of Panel A suggest that stock-financed acquisitions generate negative long-run returns, which are consistent with the M&A literature (Rau and Vermaelen, 1998, Loughran and Vijh, 1997). Bidders in the highest quartile pay the highest offer premiums as compared with those of other quartiles. In spite of this, the mean difference of offer premiums between the groups of the relative more overvalued bidders and undervalued bidders is 9.9% (significant at the 1% level) and the mean difference for long-run abnormal returns of stock bidders is 18.7% (significant at the 10% level). This indicates that relatively more overvalued bidders, though overpaying for acquisitions, they tend to outperform their undervalued counterparts. Similarly, we estimate the long-run performance of bidders with the size-adjusted model reported in Panel B. The results are consistent with those under the market-adjusted model.

Our results suggest that stock bidders paying high offer premiums according to the RRP are able to protect the wealth of long-run shareholders, evidence consistent with Ang and Cheng (2006) who found long-run performance of stock bidders and overvaluation been positively related. However, we contradict the findings of Lin *et al*. (2011) who conducted similar tests as ours for the long-run performance of the overvalued bidders. Their paper classifies bidder valuation by the ratio of price-to-fundamental value (P/V) with higher P/V indicating a more overvalued bidder, indicating that bidders who have the highest P/V generate a significant negative market performance for both short and long runs within three years after M&As as compared with those bidders in the other P/V quartiles.

5. Robustness checks

5.1 Endogeneity issues

OLS can be subject to endogeneity issues arising from omitted variable biases in this paper, as the RRP maybe correlated with firms' mismanagement or mispricing which cannot be observed or the possibility that the market perception is likely the be an accurate reflection of the firm's valuation. If the market could accurately estimate the value of the firm, the managers should have no chance of timing the market through the RRP. However, this tends to be unrealistic as the misvaluation hypothesis proposes. In this case, we suggest that the market's 52-week high and the bidder's and

target's recency ratio to be used as instrumental variables given that they are not correlated with offer premiums but correlated with the RRP. The market's 52-week high is an ideal instrumental variable as it is uncorrelated with the firm's mismanagement. Baker *et al*. (2012) also indicate that market-wide valuation should be highly correlated with the reference point prices. We also suggest that the bidder's and the target's recency ratios can be used as instrument variables due to investors' attention bias. Following Bhootra and Hur (2013), a firm reaches to its 52-week high price in the recent past is more salient to the investors' minds, leading the firm's price to be more overreacted. Thus, high recency ratio indicates that firms are overvalued.

[Insert Table 9 here]

According to our results presented in *Table 9,* the OLS is preferred over the 2SLS.[22] This is because the market 52-week high reflects the market-wide valuation instead of the firm-specific valuation which is believed to be an important source of valuation error (Rhodes-Kropf *et al*., 2005). We also believe that longer investment horizons should be less relevant to firms' valuation than shorter ones, as recent events would potentially have a bigger impact on investors' decision-making process compared to the more distant events (Bhootra and Hur, 2013). Overall, the OLS is likely to dominate the 2SLS.

5.2 The effect of the RRP on the probability of using stocks

A series of robustness checks regarding the RRP effect on the probability of using stocks are conducted and reported in Appendix D. Shleifer and Vishny (2003) predict that bidders use stocks when they are relatively more overvalued. We divided our M&A sample into two subgroups: the relatively more overvalued bidders (i.e. RRP>0), and the relatively more undervalued bidders (i.e. RRP<0), as presented in Panel A.[23] Our results suggest that the RRP effect on the probability of using stocks is solely driven by the relatively more overvalued bidders. Panel B reports the probability of using stocks rather than other means of payment is also large when the RRP increases. Panel C reports the results of stocks as a percentage of method of payment on the RRP. Our results continue to hold by replacing the binary variable with a continuous variable.

[22] Specifically, the Hausman test shows a *p*-value of 0.5252, indicating there is no endogeneity issues in the regression.

[23] There are 1,742 observations in regressions. 1,103 fall into the group of relatively more overvalued bidders and 639 fall into the opposite. 50 observations are dropped due to multicollinearity problems of the year and industry dummies.

5.3 The effect of the RRP on the offer premium

We report the RRP effect on offer premiums across different subsamples in Appendix E. We divide our samples into subsamples according to the method of payment, deal type, deal choice and deal status. Our control variables are as the same as those presented in the specification (5) of *Table 5*. Specifications (1) and (2) report a positive relationship between the RRP and offer premiums by different method of payment subsamples. The offer premium is larger when paying with cash than stocks, which is consistent with our univariate analysis results of Panel D of *Table 6*. The RRP effect remains strong for both successful and unsuccessful M&A deals, suggesting that the RRP serves as a valuation benchmark for deal initiation. This result contradicts the suggestion of Chira and Madura (2015) that the two firms involved with a higher price relative to their reference points are likely to complete the deal, while those with a lower price relative to their reference points are less willing to complete the deal, in that the firms see large disadvantages in the negotiation position.[24] Therefore, it is evident that the RRP effect on offer premiums is strong regardless of different subsamples by deal characteristics.

Our study also provides evidence that the RRP can be utilised as a piece of information relating to the firm's valuation when the target's information asymmetry level is high, making difficult for the bidder to estimate the true valuation of the target firm. We partition our sample by the median value of target's information asymmetry and our results are reported in Panel B. The RRP effect on offer premiums appears to be stronger for the higher target information asymmetry subsample compared with the lower subsample. Our results are in line with the view of Burghof and Prothmann (2011), finding a positive relationship between firm's reference point prices and the level of information uncertainty.

6. Conclusions

This paper investigates the misvaluation hypothesis using the reference point theory of M&As. We develop a bilateral valuation framework with the RRP and our results that are consistent with the misvaluation hypothesis.

We put the targets' and the bidders' reference points into the M&A platform, affirming that the

[24] They examine the reference point effect on the probability of deal completion. The significance level of the reference point is significantly weakened after different controls included in the logistic regression model.

propensity to pay for acquisitions with stocks is greater when the RRP increases. This trend appears to be more pronounced when the market misperception of the firm's valuation is high. Moreover, the offer premium increases with the RRP, leading to more negative bidder (positive target) announcement returns, indicating that the RRP plays a role in overpayment, which is in line with the misvaluation hypothesis. Using a quartile analysis for a sample of all stock-financed acquisitions, we find that the relatively more overvalued bidders receive less negative long-run abnormal returns by the RRP suggesting that bidders time the market through the RRP. Our results show that the RRP can be a reliable indicator for firm's valuation.

This study contributes to the behavioral finance and M&A literature in many ways. We provide a simply way of structuring M&A through the RRP which reflects the most current market reactions to the firm's valuations. The valuation measure is a benchmark for the firm's valuation at the market level. The market tends to react to bidders' announcements negatively due to a high offer premium paid according to the RRP. This is different from the reason of bidders looking at the reference points. Our findings reveal that higher offer premiums according to the RRP would reduce negative market reactions in the long run, suggesting that focusing on the RRP is also a bidder's thinking weighed for the value of the firm. Therefore, bidders are rational by employing the RRP for M&A pricing decision. We also find that managers who have more information about the firm than the outsiders are also subject to the reference point effect. Overall, our results suggest that managers use the RRP to time the market and formulate M&A strategies, consistent with the misvaluation hypothesis.

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Table 1. Summary statistics for acquisition sample

This table reports summary statistics for 1,878 U.S. domestic public deals announced between 1985 and 2014. The number *N* denotes the number of deals per year. The third and fourth columns present the mean and median of deal value. The fifth to seventh columns present the method of payment. Here "Stock" refers to all-stock acquisitions. "Cash" refers to all-cash acquisitions. "Mix" refers to acquisitions that are neither all stock-financed nor all cash-financed acquisitions. "Completed" refers to completed deals (i.e. successful deals), and there are 1,874 with information relating to deal status. "Tender" refers to tender offers. "Hostile" refers to hostile bids. "Diversification" refers to diversified deals in which the primary two Standard Industry Classification codes are different between bidders and targets.

Year	N	Deal Value ($mils)		Payment Method			Completed		Tender		Hostile		Diversification	
		Mean	Median	Cash	Stock	Mix	Yes	No	Yes	No	Yes	No	Yes	No
1985	5	243.86	53.00	3	1	1	3	2	-	5	1	4	2	3
1986	21	129.04	41.70	18	1	2	18	3	7	14	1	20	15	6
1987	34	254.60	47.25	18	6	8	30	3	6	28	5	29	17	17
1988	30	381.53	68.92	15	8	7	24	6	11	19	6	24	16	14
1989	24	114.04	30.49	11	10	3	17	6	4	20	1	23	18	6
1990	23	579.03	29.38	12	7	4	18	5	5	18	3	20	10	13
1991	23	172.38	26.82	7	14	1	19	3	3	20	-	23	14	9
1992	21	155.46	51.44	6	13	2	17	4	1	20	2	19	12	9
1993	45	519.07	114.00	14	18	12	33	12	7	38	5	40	20	25
1994	61	222.95	74.12	23	30	8	46	14	9	52	7	54	18	43
1995	98	538.98	74.91	27	53	18	84	14	14	84	6	92	38	60
1996	95	684.53	138.25	31	40	24	80	15	18	77	9	86	36	59
1997	130	645.10	232.11	19	62	49	113	17	19	111	3	127	46	84
1998	138	1208.89	140.12	36	54	47	126	12	27	111	3	135	47	91
1999	164	1513.65	305.42	61	58	45	134	30	41	123	14	150	68	96
2000	136	2286.88	378.34	35	68	33	119	17	32	104	8	128	49	87
2001	109	1115.01	146.89	33	40	36	94	15	27	82	4	105	38	71
2002	49	1784.72	268.90	20	14	15	44	5	16	33	4	45	18	31
2003	71	807.01	130.82	27	18	26	65	6	19	52	5	66	19	52
2004	66	2859.54	479.02	25	16	25	60	6	6	60	3	63	22	44
2005	66	2874.25	500.75	29	13	24	60	6	7	59	5	61	24	42
2006	75	1838.00	563.07	40	12	23	65	10	6	69	4	71	29	46
2007	60	1478.29	792.51	39	6	15	53	7	12	48	2	58	18	42
2008	57	2208.95	234.26	35	6	16	40	17	14	43	10	47	17	40
2009	44	3498.35	496.88	17	8	19	41	3	16	28	-	44	18	26
2010	56	1884.97	572.72	33	9	14	47	9	16	40	5	51	15	41
2011	41	2691.37	611.62	16	8	17	28	13	8	33	9	32	13	28
2012	38	1385.71	622.51	26	1	11	37	1	10	28	-	38	17	21
2013	44	1997.05	1139.09	28	5	11	39	5	9	35	3	41	12	32
2014	54	6908.66	1662.39	22	9	23	43	11	10	44	6	48	16	38
Total	1878	1540.29	227.49	726	608	539	1597	277	380	1498	134	1744	702	1176

Table 2. Summary statistics for variables

This table reports the number, mean, median and standard deviation of variables. Firms' 3-day CARs were calculated using the market model, with parameters estimated between 261 and 28 trading days prior to the announcement date. Offer premiums are the logarithmic term difference between offer price and target stock price 30 calendar days prior to the announcement date. Reference point is the logarithmic term difference between a firm's highest price over 335 calendar days ending 30 days prior to the announcement date and the price on 30 days prior to the announcement date. The RRP is the difference between the target and the bidder reference points. "Relative Size" is defined as the deal value divided by bidder MV, where bidder MV is defined as the product of market price and outstanding shares (CRSP: SHROUT*PRC). ROA is return-on-asset ratio, defined as net income (Compustat: NI) divided by total asset (Compustat:AT). MTBV is market-to-book value, defined as the market value of equity to the book value of equity, where book value of equity is total shareholders' equity (Compustat: SEQ) plus deferred taxes and investment tax credit (Compustat: TXDITC) minus the preferred stock redemption value (Compustat: PSTKRV). Volatility is the standard deviation of daily returns over the 335 calendar days ending 30 days prior to the announcement date. CF/E is cash flow-to-equity ratio, defined as income before extraordinary items (Compustat: IBC) plus depreciation and amortization (Compustat: DPC) minus cash dividends (Compustat: DV), and leverage is measured by debt-to-equity ratio, defined as total long-term debt (Compustat: DITT) divided by the book value of equity. Run-ups are the pre-bid run-up prices calculated in the time-window of [-365, -7]. All accounting variables were in the fiscal year end before the announcement date, and continuous variables were winsorised at the 1% and 99% levels.

Variables	N	Mean	Median	Std. Dev.
Panel A: Main Dependent Variables				
Offer Premiums	1878	0.310	0.292	0.282
Bidder 3-day CARs	1878	-0.011	-0.007	0.073
Target 3-day CARs	1878	0.222	0.176	0.240
Panel B: Main Variables of Interest				
Bidder Reference Point	1878	0.294	0.157	0.351
Target Reference Point	1878	0.412	0.255	0.455
RRP	1878	0.118	0.055	0.420
Panel C: Other Variables: deal, bidder, and target characteristics				
Cash	1878	0.387	-	0.487
Stock	1878	0.324	-	0.468
Hostile	1878	0.071	-	0.257
Tender	1878	0.202	-	0.402
Diversification	1878	0.374	-	0.484
Relative Size	1878	0.401	0.191	0.555
Bidder lnMV	1878	7.500	7.443	2.159
Bidder MTBV	1878	3.991	2.632	6.269
Bidder ROA	1878	0.026	0.047	0.138
Bidder Volatility	1878	0.029	0.025	0.017
Bidder RunUps	1878	0.156	0.100	0.457
Bidder Leverage	1872	0.661	0.330	1.194
Bidder CF/E	1804	0.161	0.180	0.316
Target lnMV	1878	5.212	5.133	1.839
Target MTBV	1878	2.691	1.797	4.300
Target ROA	1878	-0.049	0.024	0.241
Target Volatility	1878	0.041	0.035	0.022
Target RunUps	1878	0.107	0.051	0.573
Target Leverage	1870	0.619	0.140	1.621

Table 3. The effect of the RRP on the probability of using stocks

This table reports binomial logistic regression for all-stock acquisitions on the RRP. Dependent variable is "Stock", which is a dummy variable, taking a value of 1 if acquisitions are 100% financed with stocks, 0 otherwise. Variable definitions are as in the notes to Table 2. Robust *t*-statistics are reported in parentheses. Statistical significance at the 1%, 5% and 10% levels was denoted ***, ** and * respectively and reported alongside marginal effects. We transferred coefficients into marginal effect (ME), evaluated at the sample means of the independent variables. All year and industry effects were included in the regressions.

	(1)			(2)			(3)			(4)		
Stock	Coef.	*t*-stat.	ME	Coef.	*t*-stat.	ME	Coef.	*t*-stat.	ME	Coef.	*t*-stat.	ME
RRP	0.567***	(3.739)	0.103	0.605***	(3.793)	0.110	0.531***	(3.376)	0.097	0.570***	(3.453)	0.104
Hostile	-0.777**	(-2.469)	-0.141	-0.742**	(-2.345)	-0.135	-0.721**	(-2.296)	-0.132	-0.670**	(-2.137)	-0.123
Tender	-2.441***	(-9.766)	-0.443	-2.402***	(-9.529)	-0.436	-2.563***	(-9.485)	-0.468	-2.502***	(-9.200)	-0.458
Diversification	0.146	(1.113)	0.027	0.124	(0.936)	0.023	0.146	(1.081)	0.027	0.120	(0.881)	0.022
RelativeSize	-0.611***	(-4.042)	-0.111	-0.662***	(-4.296)	-0.120	-0.561***	(-3.576)	-0.102	-0.606***	(-3.767)	-0.111
Bidder lnMV	-0.379***	(-6.845)	-0.069	-0.290***	(-4.886)	-0.053	-0.402***	(-7.193)	-0.073	-0.314***	(-5.215)	-0.057
Bidder MTBV	0.048***	(4.326)	0.009	0.036***	(3.337)	0.007	0.060***	(4.710)	0.011	0.048***	(3.846)	0.009
Bidder ROA	-2.063***	(-4.033)	-0.375	-0.914*	(-1.704)	-0.166	-2.464***	(-4.017)	-0.450	-1.407**	(-2.174)	-0.257
Target lnMV	0.315***	(4.845)	0.057	0.350***	(5.042)	0.063	0.348***	(5.221)	0.064	0.375***	(5.187)	0.069
Target MTBV	0.051***	(3.417)	0.009	0.041***	(2.758)	0.008	0.063***	(3.857)	0.012	0.055***	(3.302)	0.010
Target ROA	0.087	(0.303)	0.016	0.371	(1.199)	0.067	0.009	(0.029)	0.002	0.218	(0.687)	0.040
Target Volatility				5.118	(1.144)	0.928				3.773	(0.800)	0.690
Bidder Volatility				32.029***	(4.903)	5.809				30.994***	(4.517)	5.670
Bidder Leverage							-0.232***	(-3.367)	-0.042	-0.211***	(-3.167)	-0.039
Target Leverage							-0.126***	(-3.016)	-0.023	-0.121***	(-2.793)	-0.022
Bidder CF/E							0.213	(0.836)	0.039	0.233	(0.868)	0.043
Year	Yes			Yes			Yes			Yes		
Industry	Yes			Yes			Yes			Yes		
Constant	0.324	(0.558)		-1.480**	(-2.146)		0.592	(0.915)		-1.130	(-1.508)	
N	1878			1878			1792			1792		
Pseudo R^2	0.272			0.287			0.291			0.303		

Table 4. Testing the effect of the RRP on the probability of using stocks under different market-wide valuations

This table reports binomial logistic regression for all-stock acquisitions on the RRP by different market conditions. Dependent variable is "Stock", which is a dummy variable, taking value of 1 if acquisitions are financed with 100% stocks, 0 otherwise. High Market is a dummy variable, taking a value of 1 if takeover months in the top 25% above past 5-year average de-trended P/E of the market index (S&P 500) or market valuation is high, 0 otherwise. Specifications (1)-(3) report the results for high, low and neutral valuation periods, respectively. We were able to determine 1733 observations with valid market-wide valuation data, 666 for high valuation periods, 434 for low valuation periods, and 633 for neutral valuation periods. Variable definitions are as in the notes to Table 2. Robust *t*-statistics were reported in parentheses. Statistical significance at the 1%, 5% and 10% levels was denoted ***, ** and * respectively and reported alongside marginal effects. We transferred coefficients into marginal effect (ME), evaluated at the sample means of the independent variables. All year and industry effects were included in the regressions.

Stock	(1) High			(2) Low			(3) Neutral		
	Coef.	*t*-stat.	ME	Coef.	*t*-stat.	ME	Coef.	*t*-stat.	ME
RRP	0.758***	(3.049)	0.153	1.021	(1.583)	0.059	0.510*	(1.902)	0.109
Hostile	-0.317	(-0.735)	-0.064	-1.043	(-1.284)	-0.060	-0.723	(-0.969)	-0.155
Tender	-2.339***	(-6.194)	-0.473	-1.195**	(-2.037)	-0.069	-4.251***	(-5.319)	-0.910
Diversification	0.797***	(3.383)	0.161	-0.165	(-0.418)	-0.010	-0.060	(-0.263)	-0.013
RelativeSize	-0.968***	(-4.184)	-0.196	-0.847	(-1.550)	-0.049	-0.307	(-1.180)	-0.066
Bidder lnMV	-0.377***	(-4.014)	-0.076	-0.809***	(-3.746)	-0.047	-0.141	(-1.398)	-0.030
Bidder MTBV	0.052***	(3.078)	0.011	0.060	(1.337)	0.003	0.038	(1.601)	0.008
Bidder ROA	-2.376***	(-2.602)	-0.481	-1.664	(-0.751)	-0.096	-2.797*	(-1.804)	-0.599
Target lnMV	0.600***	(5.282)	0.121	0.696**	(2.453)	0.040	0.170	(1.401)	0.036
Target MTBV	0.062**	(2.416)	0.013	-0.004	(-0.081)	0.000	0.063**	(1.968)	0.014
Target ROA	-0.154	(-0.300)	-0.031	0.069	(0.078)	0.004	0.699	(1.230)	0.150
Target Volatility	8.929	(1.141)	1.808	-1.335	(-0.061)	-0.077	-1.354	(-0.169)	-0.290
Bidder Volatility	15.449	(1.459)	3.127	35.750	(1.477)	2.068	51.081***	(4.021)	10.936
Bidder Leverage	-0.306***	(-3.064)	-0.062	-0.219	(-1.029)	-0.013	-0.169	(-1.440)	-0.036
Target Leverage	-0.129*	(-1.697)	-0.026	-0.089	(-0.934)	-0.005	-0.203**	(-2.477)	-0.043
Bidder CF/E	0.096	(0.265)	0.019	-0.634	(-0.918)	-0.037	2.044***	(3.192)	0.438
Year	Yes			Yes			Yes		
Industry	Yes			Yes			Yes		
Constant	-2.916**	(-2.137)		-0.057	(-0.032)		0.044	(0.030)	
N	666			434			633		
Pseudo R^2	0.345			0.268			0.333		

Table 5. The effect of the RRP on the offer premium

This table reports the OLS regression results for offer premiums on the RRP. Specification (1) reports the relationship between offer premiums and the reference point effect, specification (2) controlled for deal characteristics, specification (3) controlled for deal and bidder characteristics, specification (4) controlled for deal and target characteristics, specification (5) controlled for all variables. All year and industry effects were also included in the regressions. Variable definitions are as in the notes to Table 2. Robustness *t*-statistics were reported in parentheses. Statistical significance at the 1%, 5% and 10% levels was denoted ***, **and * respectively and reported alongside coefficients.

	(1)		(2)		(3)		(4)		(5)	
Offer Premiums	Coef.	*t*-stat.	Coef.	*t*-stat.	Coef.	*t*-stat.	Coef.	*t*-stat.	Coef.	*t*-stat.
RRP	0.101***	(5.099)	0.105***	(5.311)	0.106***	(5.290)	0.134***	(6.199)	0.109***	(4.726)
Hostile			0.008	(0.367)	0.000	(0.018)	0.019	(0.898)	0.033	(1.620)
Tender			0.075***	(4.744)	0.075***	(4.728)	0.083***	(5.284)	0.078***	(5.166)
Diversification			0.006	(0.433)	0.004	(0.311)	0.007	(0.488)	-0.015	(-1.110)
Stock			-0.024	(-1.336)	-0.019	(-1.034)	-0.021	(-1.131)	-0.002	(-0.100)
Cash			-0.009	(-0.565)	-0.001	(-0.071)	-0.020	(-1.194)	-0.029*	(-1.808)
RelativeSize					0.020	(1.515)	0.023*	(1.950)	0.114***	(7.151)
Bidder ROA					0.084	(1.182)			0.019	(0.271)
Bidder MTBV					-0.001	(-0.665)			-0.000	(-0.353)
Bidder lnMV					0.005	(1.163)			0.054***	(9.321)
Bidder Volatility					0.219	(0.297)			0.808	(1.007)
Bidder RunUps					0.036**	(1.964)			0.018	(0.866)
Target ROA							0.099**	(2.366)	0.124***	(2.949)
Target MTBV							-0.003*	(-1.953)	-0.003*	(-1.727)
Target lnMV							-0.033***	(-7.113)	-0.078***	(-11.766)
Target Volatility							-0.806	(-1.425)	-0.835	(-1.338)
Target RunUps							0.063***	(4.079)	0.040**	(2.247)
Constant	0.212***	(3.291)	0.182***	(2.744)	0.133*	(1.779)	0.357***	(4.741)	0.180**	(2.280)
Year	Yes		Yes		Yes		Yes		Yes	
Industry	Yes		Yes		Yes		Yes		Yes	
N	1878		1878		1878		1878		1878	
adj. R^2	0.077		0.088		0.091		0.127		0.174	

Table 6. Univariate analysis by different RRP groups

This table reports univariate analysis results for the offer premium, the bidder and the target's cumulative abnormal returns (CAR3) in a 3-day window around the announcement date by the RRP. CAR3 were calculated with market model. We divided our sample into those RRP less than 0 (i.e. RRP<0 group), which represents the bidder is relatively more undervalued than the target and those RRP larger than 0 (i.e. RRP>0 group), which represents the bidder is relatively more overvalued than the target. Panel A reports the univariate analysis results for the offer premium. Panel B reports the univariate analysis results for the bidder CAR3. Panel C reports the univariate analysis results for the target CAR3. Panel D reports univariate analysis for the offer premium by the method of payment. Here "Cash" represents that acquisitions are 100% financed with cash. "Stock" represents acquisitions that are 100% financed by stocks. Specifications (1) and (2) of Panel D report offer premiums of 100% cash-financed acquisitions at RRP>0 and RRP<0 groups. Specifications (3) and (4) of Panel D report offer premiums of 100% stock-financed acquisitions at RRP>0 and RRP<0 groups. The mean value, *t*-statistics, and the number of observations for the offer premium, the bidder and the target 3-day abnormal returns around the announcement date were reported in each Panel. The mean difference of *t*-tests is reported at the end of each Panel. *T*-statistics were reported in parentheses. Statistical significance at the 1%, 5% and 10% levels was denoted ***, ** and * respectively.

Panel A: Univariate analysis for the offer premium

	Offer Premiums	*t*-stat.	N
(1) RRP<0	0.279***	(30.20)	723
(2) RRP>0	0.329***	(37.26)	1,155
Mean difference (2)-(1)	0.050***	(-3.79)	

Panel B: Univariate analysis for the bidder CAR3

	Bidder CAR3mm	*t*-stat.	N
(1) RRP<0	-0.006**	(-2.27)	723
(2) RRP>0	-0.014***	(-6.37)	1,155
Mean difference (2)-(1)	-0.008**	(-2.28)	

Panel C: Univariate analysis for the target CAR3

	Target CAR3mm	*t*-stat.	N
(1) RRP<0	0.191***	(23.81)	723
(2) RRP>0	0.240***	(32.34)	1,155
Mean difference (2)-(1)	0.049***	(4.33)	

Panel D: Univariate analysis for the offer premium by the method of payment in different RRP subgroups

	(1)	(2)	(3)	(4)	Mean difference			
	RRP>0	RRP<0	RRP>0	RRP<0	(1)-(2)	(3)-(4)	(1)-(3)	(2)-(4)
	Cash		Stock					
Offer Premiums (%)	35.25***	26.75***	31.33***	29.22***	8.50***	2.11	3.92*	-2.47
t-stat	(25.18)	(20.90)	(19.07)	(14.51)	(4.24)	(0.80)	(1.88)	(-1.08)
N	435	291	402	206	724	608	837	497

Table 7. Whether relatively more overvalued bidders benefit in the short run?

This table reports univariate analysis results for the bidder and the target's 3-day cumulative abnormal returns (CAR3) by RRP quartiles, as reported in Panel A and Panel B, respectively. The firm's CAR3 were calculated with the market model. The parameters were estimated in the window [-261,-28]. The mean value, *t*-statistics, and the number of observations for bidder CAR3 and target CAR3 are reported in each Panel. The mean difference of *t*-tests is reported at the end of each Panel. Variable definitions are as in the notes to Table 2. *T*-statistics were reported in parentheses. Statistical significance at the 1%, 5% and 10% levels was denoted ***, **and * respectively.

Panel A: Bidder 3-day CARs by RRP quartiles			
	Bidder CAR3	*t*-stat.	N
1 (RRP<0)	-0.0069**	(-2.04)	470
2	-0.0091***	(-3.05)	469
3	-0.0066*	(-1.96)	470
4 (RRP>0)	-0.0207***	(-5.58)	469
Mean difference 4-1	-0.0138***	(-2.77)	
Panel B: Target 3-day CARs by RRP quartiles			
	Target CAR3	*t*-stat.	N
1 (RRP<0)	0.2016***	(19.26)	470
2	0.1736***	(19.92)	469
3	0.2265***	(22.09)	470
4 (RRP>0)	0.2846***	(20.73)	469
Mean difference 4-1	0.0830***	(4.81)	

Table 8. Do stock bidders protect the wealth of long-run shareholders?

Panel A of this table reports the univariate analysis results of both the offer premium and the firms' 36-month market-adjusted buy-and-hold abnormal returns (BHAR36ma) by RRP quartiles. The sample used in this analysis only consists of 100% stock-financed acquisitions. Each quartile was assigned a rank from 1 to 4. Rank 1 represents bidders that are relatively more undervalued than their targets (i.e. RRP<0), and rank 4 represents bidders that are relatively more overvalued than their targets (i.e. RRP>0). Panel B of this table serves as a robustness check of the results of Panel A. It reports the univariate analysis results of both the offer premium and the firms' 36-month size-adjusted buy-and-hold abnormal returns (BHAR36sa) by the RRP. We divided the RRP into three levels, the bottom one third or rank 1 refers to bidders are relatively more undervalued, while the top one third or rank 3 refers to bidders are relatively more overvalued, the middle rank accounts for the remaining observations. We report mean value, *t*-statistics and the number of the offer premium at each rank. BHAR36ma and BHAR36sa are winsorised at the 1% and 99% levels. We performed the bootstrap estimation of sampling distribution of BHAR36ma and BHAR36sa at 1000 replications, and report mean value, *p*-value and the number of BHAR36ma and BHAR36sa of each rank. The mean difference of *t*-tests was reported at the end of the table. *T*-statistics (or *p*-value for long-run BHARs) were reported in parentheses. Statistical significance at the 1%, 5% and 10% levels was denoted ***, ** and * respectively.

Panel A: Market-adjusted 36-month BHARs by RRP quartiles

All stock-financed acquisitions	Offer Premiums	*t*-stat.	N	BHAR36ma	*p*-value	N
1 (RRP<0)	0.296***	(12.12)	152	-0.348***	(0.000)	137
2	0.251***	(11.74)	152	-0.221**	(0.017)	144
3	0.283***	(12.02)	152	-0.198**	(0.025)	145
4 (RRP>0)	0.395***	(13.86)	152	-0.161*	(0.093)	147
Mean difference 4-1	0.099***	(2.63)		0.187*	(0.079)	

Panel B: Size-adjusted 36-month BHARs by RRP (*Robustness check*)

All stock-financed acquisitions	Offer Premiums	*t*-stat.	N	BHAR36sa	*p*-value	N
1	0.294***	(14.53)	201	-0.400***	(0.003)	158
2	0.262***	(13.04)	201	-0.206**	(0.040)	180
3 (RRP>0)	0.360***	(15.29)	206	-0.253***	(0.001)	174
Mean difference 3-1	0.066**	(2.11)		0.147*	(0.073)	

Table 9. Endogeneity issues

This table reports the RRP effect on the offer premium by controlling for endogeneity issues. Results from an OLS regression and a 2SLS regression are presented in this table. The RRP was treated as an endogenous variable. The market 52 week high and the bidder and the target rencecy ratio were treated as instrumental variables. We first obtained the fitted value from the regression of the RRP on the instrument variables and then replaced the RRP with the fitted value. Results were reported in the "IV" Column. The market 52-week high is defined as the logarithmic term difference between the highest total market value (CRSP: TOTVAL) over the 335 calendar days ending 30 days prior to the announcement date and the total market value 30 days prior to the announcement date, similar to the definition of the target and bidder reference points. The bidder (the target) recency ratio is defined as 1 subtracts the number of days between the date of the firm's 52-week high price and the takeover announcement date divided by 365 days, larger the value suggests the firm's 52-week high price occurs more recently. Variable definitions are as in the notes to Table 2. Robustness *t*-statistics were reported in parentheses. Statistical significance at the 1%, 5% and 10% levels was denoted ***, ** and * respectively and reported alongside coefficients. The results of the Hausman test, first-stage test and the Sargan score were reported in the lower part of the table.

Offer Premiums	OLS		IV	
	Coef.	*t*-stat.	Coef.	*t*-stat.
RRP	0.109***	(4.726)	0.046	(0.444)
Hostile	0.033	(1.620)	0.032	(1.279)
Tender	0.078***	(5.166)	0.077***	(4.621)
Diversification	-0.015	(-1.110)	-0.016	(-1.215)
Stock	-0.002	(-0.100)	0.000	(0.010)
Cash	-0.029*	(-1.808)	-0.030*	(-1.786)
RelativeSize	0.114***	(7.151)	0.116***	(7.501)
Bidder ROA	0.019	(0.271)	0.008	(0.150)
Bidder MTBV	-0.000	(-0.353)	-0.001	(-0.502)
Bidder lnMV	0.054***	(9.321)	0.054***	(9.895)
Bidder Volatility	0.808	(1.007)	0.115	(0.088)
Bidder RunUps	0.018	(0.866)	0.039	(1.038)
Target ROA	0.124***	(2.949)	0.117***	(3.582)
Target MTBV	-0.003*	(-1.727)	-0.003*	(-1.648)
Target lnMV	-0.078***	(-11.766)	-0.078***	(-12.484)
Target Volatility	-0.835	(-1.338)	-0.138	(-0.113)
Target RunUps	0.040**	(2.247)	0.013	(0.278)
N	1878		1878	
adj. R^2	0.174		0.174	
Hausman test	0. 4038	(*p*=0.5252)		
F-stat.	22.0734	(*p*=0.0000)		
Over-identifying restrictions (Sargan score)	43.3021	(*p*=0.0000)		

Appendix A. Variables correlation matrix

This table reports pairwise Pearson correlation of the variables used in the regression of offer premiums on the RRP. All variables definitions are as in the note of Table 2.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. RRP	1.000																
2. Hostile	-0.045	1.000															
3. Tender	-0.020	0.133	1.000														
4. Diversification	-0.007	-0.018	0.025	1.000													
5. Stock	0.096	-0.112	-0.292	-0.029	1.000												
6. Cash	-0.036	0.052	0.332	0.114	-0.549	1.000											
7. RelativeSize	-0.094	0.208	-0.071	-0.118	0.010	-0.272	1.000										
8. Bidder ROA	-0.090	0.010	0.088	0.097	-0.188	0.173	-0.119	1.000									
9. Bidder MTBV	0.009	-0.066	-0.046	-0.010	0.151	-0.077	-0.079	0.145	1.000								
10. Bidder lnMV	-0.047	-0.050	0.094	0.076	-0.184	0.181	-0.376	0.313	0.204	1.000							
11. Bidder Volatility	0.067	-0.035	-0.069	-0.068	0.333	-0.257	0.145	-0.484	0.111	-0.418	1.000						
12. Bidder RunUps	0.113	-0.016	-0.073	-0.026	0.188	-0.165	-0.008	-0.067	0.302	0.058	0.304	1.000					
13. Target ROA	-0.279	0.062	0.009	0.029	-0.065	0.011	0.100	0.300	-0.004	0.091	-0.287	0.017	1.000				
14. Target MTBV	-0.128	-0.037	-0.019	0.009	0.125	-0.071	-0.052	0.038	0.184	0.159	0.066	0.169	0.043	1.000			
15. Target lnMV	-0.209	0.109	-0.005	-0.084	-0.096	-0.076	0.187	0.176	0.115	0.621	-0.317	0.053	0.305	0.191	1.000		
16. Target Volatility	0.308	-0.109	-0.007	0.038	0.232	-0.076	-0.152	-0.270	0.093	-0.237	0.629	0.169	-0.470	0.039	-0.511	1.000	
17. Target RunUps	-0.371	-0.048	-0.013	0.002	0.009	0.007	-0.054	0.044	0.117	0.122	0.073	0.375	0.067	0.303	0.057	0.203	1.000

Appendix B. Testing the effect of the RRP on the offer premium over time

This table reports the OLS regression results for offer premiums on the RRP over time. Specifications (1)-(3) report results before 1990, 1990 to 2000, and after 2000 respectively. Specifications (4) and (5) divided the whole sample after 2000 into two periods before and after the 2008. Variable definitions are as in the notes to Table 2. Robustness *t*-statistics were reported in parentheses. Statistical significance at the 1%, 5% and 10% levels was denoted ***, **and * respectively and reported alongside coefficients.

	(1)		(2)		(3)		(4)		(5)	
Offer Premiums	1985-1989		1990-2000		2001-2014		2001-2007		2008-2014	
	Coef.	*t*-stat.	Coef.	*t*-stat.	Coef.	*t*-stat.	Coef.	*t*-stat.	Coef.	*t*-stat.
RRP	-0.080	(-0.973)	0.091***	(3.134)	0.146***	(3.568)	0.105**	(2.128)	0.213***	(3.211)
Hostile	-0.051	(-0.547)	0.057*	(1.939)	0.032	(1.091)	0.089**	(2.264)	-0.003	(-0.067)
Tender	0.179***	(2.816)	0.119***	(5.000)	0.048**	(2.173)	0.017	(0.544)	0.079**	(2.475)
Diversification	-0.041	(-0.833)	-0.001	(-0.033)	-0.023	(-1.200)	-0.045*	(-1.770)	0.010	(0.331)
Stock	0.089	(1.145)	-0.002	(-0.094)	-0.037	(-1.309)	-0.005	(-0.139)	-0.078*	(-1.798)
Cash	0.026	(0.379)	-0.087***	(-3.335)	0.006	(0.275)	0.023	(0.766)	0.006	(0.195)
RelativeSize	0.085**	(2.164)	0.131***	(5.740)	0.091***	(3.314)	0.069*	(1.878)	0.121***	(2.919)
Bidder ROA	0.584**	(2.254)	-0.004	(-0.039)	-0.003	(-0.029)	-0.080	(-0.658)	0.302	(1.274)
Bidder MTBV	0.001	(0.140)	-0.001	(-0.827)	0.002	(0.906)	0.001	(0.494)	0.003	(1.054)
Bidder lnMV	0.039**	(2.305)	0.053***	(6.055)	0.049***	(5.451)	0.036***	(3.614)	0.058***	(3.541)
Bidder Volatility	-3.192	(-0.916)	0.357	(0.332)	1.194	(0.882)	0.659	(0.392)	1.040	(0.428)
Bidder RunUps	0.087	(1.148)	0.033	(1.301)	-0.020	(-0.594)	-0.014	(-0.356)	-0.006	(-0.106)
Target ROA	0.074	(0.498)	0.161***	(2.597)	0.120*	(1.933)	0.152**	(2.180)	0.006	(0.057)
Target MTBV	-0.002	(-0.239)	-0.002	(-0.909)	-0.003*	(-1.740)	0.000	(0.166)	-0.006**	(-2.376)
Target lnMV	-0.035*	(-1.946)	-0.081***	(-8.147)	-0.074***	(-7.081)	-0.067***	(-5.134)	-0.076***	(-4.398)
Target Volatility	1.990	(0.941)	-1.329	(-1.558)	-0.283	(-0.268)	-0.356	(-0.245)	-0.522	(-0.366)
Target RunUps	0.037	(0.514)	0.060**	(2.380)	0.024	(0.905)	0.011	(0.336)	0.025	(0.608)
Constant	-0.498***	(-3.279)	0.234**	(2.478)	0.301***	(3.095)	0.288**	(2.416)	0.119	(0.747)
Year	Yes		Yes		Yes		Yes		Yes	
Industry	Yes		Yes		Yes		Yes		Yes	
N	137		911		830		496		334	
adj. R^2	0.243		0.195		0.184		0.131		0.305	

Appendix C. Testing the role of the target reference point price as overpayment

Robustness checks.

This table presents both OLS and 2SLS regression results of bidder market model 3-day announcement returns on the offer premium. Following Baker *et al.*'s approach (2012), we used the target 52-week high price as an instrumental variable. Hausman test and first-stage *F* test are reported below the table. Variable definitions are as in the notes to Table 2. Robustness *t*-statistics were reported in parentheses. Statistical significance at the 1% level, 5% level, and 10% level, denoted ***, ** and * respectively.

	(1)	(2)
	Bidder CAR3	
	OLS	IV
Offer Premiums	-0.020***	-0.140***
	(-2.805)	(-3.430)
Hostile	-0.000	0.003
	(-0.039)	(0.436)
Tender	0.008**	0.020***
	(2.102)	(3.211)
Diversification	0.001	-0.001
	(0.350)	(-0.283)
Stock	-0.010**	-0.009*
	(-2.094)	(-1.768)
Cash	0.019***	0.015***
	(4.657)	(3.121)
Relative Size	0.001	0.016**
	(0.206)	(2.365)
Bidder lnMV	0.000	0.007**
	(0.058)	(2.545)
Bidder ROA	0.033*	0.034**
	(1.846)	(2.434)
Bidder MTBV	-0.000	-0.000
	(-0.309)	(-0.567)
Bidder RunUps	-0.002	0.006
	(-0.311)	(1.235)
Target lnMV	-0.004***	-0.014***
	(-3.096)	(-3.866)
Constant	0.013	0.039***
	(1.645)	(3.109)
N	1878	1878
adj. R^2	0.053	.
Hausman test	10.7173 (p = 0.0011)	
F-test	53.5326 (p = 0.0000)	

Appendix D. The effect of RRP on the probability of using stocks

Robustness checks.

Panel A of the table reports binomial logistic regression for 100% stock-financed acquisitions on the RRP by different RRP groups. Specifically, RRP>0 represents bidders that are relatively more overvalued than their targets, and RRP<0 represents bidders that are relatively more undervalued than their targets. There are 50 observations missing due to multicollinearity problem of the year and industry dummies, so that we are left with 1,742 observations, 1,103 for RRP>0 group, and 639 for RRP<0 group. Panel B reports multinomial logistic regression results for Stock versus Cash and Stock versus Mixed. "Stock" refers to acquisitions that are 100% financed by stocks. "Cash" refers to acquisitions that are 100% financed with cash. "Mixed" refers to acquisitions that are neither 100% cash financed nor 100% stocks financed. There are 5 missing observations that are defined as "Other" in terms of the method of payment in Thomson One. Panel C reports OLS regression of stock as percentage of the method of payment on the RRP. Our control variables were as shown in the specification (4) of Table 3. Variable definitions are as in the notes of Table 2. Robustness *t*-statistics were reported in parentheses. Statistical significance at the 1%, 5% and 10% levels was denoted ***, **, and * respectively.

Panel A: Binomial logistic regressions. By the RRP		
	RRP>0	RRP<0
RRP	0.831***	-0.232
t-stat.	(3.005)	(-0.508)
Variables	Controlled	Controlled
Year &Industry	Yes	Yes
N	1103	639
Pseudo R^2	0.316	0.350
Panel B: Multinomial logistic regressions. By the method of payment		
	Stock Vs Cash	Stock Vs Mix
RRP	0.728***	0.425**
t-stat.	(3.590)	(2.380)
Variables	Controlled	Controlled
Year & Industry	Yes	Yes
N	1787	1787
Pseudo R^2	0.288	0.288
Panel C: OLS regressions. Stocks as a percentage of the method of payment		
	Stocks (%)	
RRP	4.170***	
t-stat.	(2.600)	
Variables	Controlled	
Year &Industry	Yes	
N	975	
adj. R^2	0.283	

Appendix E. The effect of the RRP on the offer premium

Robustness checks.

This table reports the OLS results for offer premiums on the RRP by different subsamples. Panel A divides the sample by the method of payment, as reported in specifications (1) and (2), by whether a deal is diversified or not, as reported in specifications (3) and (4), by whether a deal is a tender offer or not, as reported in specifications (5) and (6), and by whether a deal is successfully or not within the sample period, as reported in specifications (7) and (8). Panel B reports the RRP effect on offer premiums by the median value of target information asymmetry (IA), where target IA was calculated with the standard deviation of daily returns over the 335 calendar days ending 30 days prior to the announcement date. Specification (1) reports the results for the higher target information asymmetry subsample, and specification (2) reports the results for the lower target information asymmetry subsample. Our regressions in both Panels control all variables as in specification (5) of Table 5. All year and industry effects were included in the regressions. Robustness *t*-statistics were reported in parentheses. Statistical significance at the 1%, 5% and 10% levels was denoted ***, ** and * respectively.

Panel A: the RRP effect on offer premiums by deal information

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Method of Payment		Diversification		Tender		Successful	
	Stock	Cash	Yes	No	Yes	No	Yes	No
RRP	0.072**	0.170***	0.124***	0.098**	0.196***	0.093***	0.107***	0.129**
t-stat.	(2.012)	(4.195)	(3.357)	(3.244)	(4.518)	(3.526)	(4.335)	(2.269)
Variables	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Year & Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	608	726	702	1176	380	1498	1597	277
adj. R^2	0.159	0.234	0.167	0.176	0.235	0.151	0.170	0.232

Panel B: the RRP effect on offer premiums by target information asymmetry (IA)

	(1)	(2)
	High target IA	Low target IA
RRP	0.140***	0.039
t-stat.	(4.996)	(1.464)
Variables	Controlled	Controlled
Year & Industry	Yes	Yes
N	939	939
adj. R^2	0.148	0.189

Figure 1: Nonlinear relationship between offer premiums and the target reference point (TRP)

This figure presents the nonlinear relationship between offer premiums and the target reference point (TRP). *Offer Premiums* is the logarithmic term difference between the offer price and the target stock price 30 days prior to the takeover announcement. *TRP* is the logarithmic term difference between the target highest stock price over the 335 calendars ending 30 days prior to the announcement date and the target stock price on 30 day prior to the announcement date. We used local polynomial regression to smooth scatter plots, and set our sample where both offer premiums and TRP are larger than 0, and less than 100%. For the reason that M&As are driven by the relatively more overvalued bidders, we therefore limited our sample to the group of large RRP (or RRP>0).